CASE STUDY

Carbontech Case study 020

14" Elbow wrap with Re-enforced Strongback support

CARBONTECH

COMPOSITE SYSTEMS

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PROJECT DETAILS

Case Study Number

CTCS:020

Design Pressure

4 Bar

Repair Summary

14" Pipe wrap with Strongback

Operating Pressure

1.1 Bar

Client

Refinery in Caspian Region

Design Temperature

160°C

Service Type

Flexsorb

Operating Temperature

120°C

Line Size

2"

Base Material

SA-516 Gr-70N

Line Class

150#

ANOMALY DESCRIPTION

The external inspection found the leak through a hole with a diameter less than 1mm on the piping straight section 40mm wide within the HAZ of the flange connection attachment weld. The leak was repaired temporarily for short- term period. Ultrasonic thickness test was performed within the leaking area and on the adjacent sections of the piping. Thickness of the damaged straight section was T = 3.6 from 4.6mm, thickness of the adjacent sections is T = 8.9 from 9.6mm.

Figure 1:

Figure 2:

INTEGRITY CONCERNS

Original thickness of the damaged pipe section did not meet minimum thickness requirements. Due to the piping being below specification further deterioration of piping could cause worsening leaks and ultimately failure Operations of the piping with these non-conformities is not allowed.

THE CARBONTECH SOLUTION

By Using a patch and strap, the leak through the hole could temporarily be stopped to enable Carbontech to do a carbon fiber Composite repair to rebuild wall thickness and stop the leak (Composite wrap cannot be applied to leaking components unless leaks can be stopped). Due to the wall loss being concentrated next to the welding, Carbontech designed and manufactured a strongback restraint system that would be able to withstand total circumferential failure of the welding. The strongback was a multi part system that would restrain the elbow together with the complete assembled flange. An FEA analysis was performed to calculate stresses in the strongback components in the event of failure on the design pressure.

Surface Preparation achieved: SA2.5
Product used: Revowrap 185
Engineering calculations: ASME PCC2
Layers used: 4 layers
Post cured: Not Required - Line temperature provided sufficient heat to cure the wrap.

Figure 3: FEA

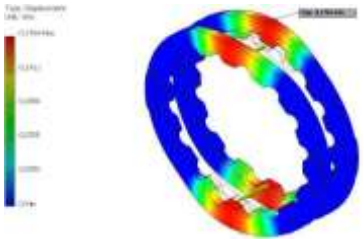

Figure 4: FEA

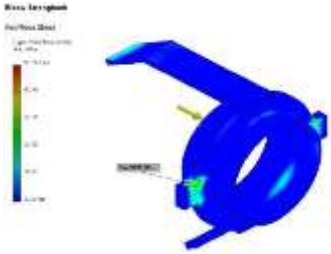

Figure 5: FEA

Figure 8: Wrap with Strongback installed

Figure 6: Hole repair with Revofill

Figure 7: Wrap before Strongback

CONCLUSION

A successful seal of the leak was achieved by the application of the patch to do a composite wrap and with the addition of the restraint system a repair was implemented that would take the line to the next scheduled TA for permanent replacement.

CARBONTECH

The place chemistry, engineering and global expertise are brought together to drive progressive innovation in advanced composite technologies for the emergency repair of critical assets "There is nothing generic about us" we don't just sell pipe wraps; we provide accurate engineering backing to deliver tailored solutions

Sound and responsible engineering is the basis on which we build our company, products and services. It is the core to our success and it is the foundation on which we have engineered and manufactured our innovative and bespoke products

We strive by a zero-failure philosophy and warrant our engineered composite solutions are tested, proven and validated. We vow to provide dependable, responsible and accurate information regarding the capabilities of our systems

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